DRISI

Caltrans Division of Research, Innovation and System Information

Research Results

Monitoring Ethanol Fuel Usage

New system that measures ethanol consumption helps support alternative fuel program

Planning/ Policy/ System Information

JANUARY 2015

Project Title:
Research and Development of an E85 Alternative Fuel Fleet Monitoring System

Task Number: 1919

Start Date: September 8, 2010

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Product Category: New tool or equipment

Task Manager:
Lai Saetern
Transportation Engineer, Electrical
lai.saetern@dot.ca.gov

WHAT WAS THE NEED?

Caltrans has been investing in a variety of alternative-fueled vehicles as part of its fleet to reduce emissions and reliance on conventional gasoline. Ethanol (E85)-compatible vehicles are part of this program. However, it has been difficult to determine how much ethanol fuel these vehicles are actually using because of their flexible-fuel capability of running on E85, gasoline, or a combination of both. Traditional methods of matching refueling records with vehicles have not provided enough insight regarding the activity of specific vehicles. To gain a more thorough understanding of alternative-fuel consumption requires a specialized telematics system to monitor vehicle activity and usage patterns. This project has been carried out in three phases. In the first phase, a prototype system was developed and tested on 10 vehicles and extended into a second phase due to time and money. This report documents the final phase, which consisted of a comprehensive evaluation to develop a deployment plan for additional vehicles and system expansion.

WHAT WAS OUR GOAL?

The goal was to develop, implement, and evaluate a system that can monitor alternative fuel consumption in the Caltrans fleet and make the data accessible to managers and supervisors.

Vehicles were stimultaneously integrated with telematics to improve installation efficiency.

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Caltrans provides a safe, sustainable, integrated and efficient transportation system to enhance California's economy and livability.

WHAT DID WE DO?

Caltrans, in partnership with the University California, Riverside Center for Environmental Research and Technology, developed a system that can remotely monitor alternative fuel usage, fuel mixture, fueling locations and times, and vehicle activity—location, miles traveled, and speed. The system's base architecture was developed in a previous pilot consisting of 10 vehicles and expanded in this phase to include 100 vehicles dispersed among four districts.

The architecture requires an onboard vehicle telematics system capable of tracking vehicles using position information from a GPS receiver. A microcontroller communicates with the system via Wi-Fi or a cellular network, sending information on vehicle activity and fuel consumption. The microcontroller interfaces with the vehicle through the OBD-II data port. The system also includes a data repository and server for receiving and storing the transmitted data and a web-based user interface for remotely reviewing the information in an accessible manner.

WHAT WAS THE OUTCOME?

The monitoring system enables staff, managers, and fleet operators to quantify fuel usage in terms of vehicle activity. When a trip starts, the system logs the real-time engine data along with the vehicle's GPS position. At the end of the trip, the information is transmitted to a computer server via a cellular connection or Wi-Fi transmitter located within the motor pool parking garages at District offices.

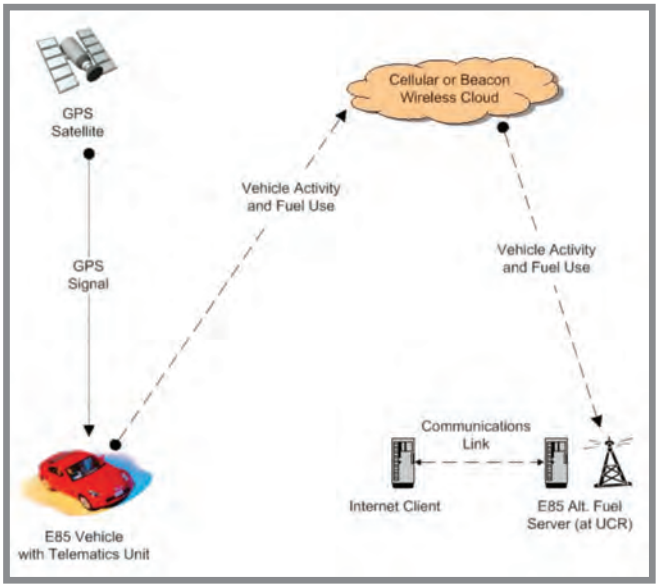
Mapping function shows trip progress and refueling.

WHAT IS THE BENEFIT?

The fuel monitoring system provides a foundation for a future deployment of a commercial-scale system. The onboard functionality informs drivers of the fuel composition, refueling locations, and emissions savings. The system promotes expanding the use of E85 vehicles because drivers and supervisors can observe and track usage and quantify the cost and environmental benefits of using alternative fuels.

LEARN MORE

To view the complete report:
www.dot.ca.gov/research/researchreports/reports/2015/final_report_task_1919.pdf



E-85 fuel usage monitoring architecture with combined cellular and Wi-Fi communications